2011 Differentiated Instruction Institute:
"Just Right—Right Now"—Across the Spectrum

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Building Higher Order Thinking Skills into Content Instruction

Presenter: Sarah Armstrong, Ed.D.
Leading and Learning Solutions
Email: Sarmstrong@cyberwind.net
Website: www.leadingandlearningsolutions.com

The Questions

Do we promote "thinking classrooms" for ALL students?!

(ELA) Grade-Level Expectations: Sixth Grade

Standard 7:

11. Demonstrate understanding of information in grade-appropriate texts using a variety of strategies, including:
- sequencing events and steps in a process
- summarizing and paraphrasing information
- identifying stated or implied main ideas and supporting details
- comparing and contrasting literary elements and ideas
- making simple inferences and drawing conclusions
- predicting the outcome of a story or situation
- identifying literary devices (ELA-7-M1)

12. Examine and explain the relationship between life experiences and texts to generate solutions to problems (ELA-7-M2)

http://www.doe.state.la.us/lde/uploads/3902.pdf

Social Studies Grade-Level Expectations: Civics

1. Explain competing ideas about the purposes of politics and government and identify reasons why government is necessary (C-1A-H1)

4. Analyze ways in which the purposes of the U.S. government, as defined in the U.S. Constitution, are achieved (e.g., protecting individual rights, providing for the general welfare) (C-1A-H1)

5. Compare and contrast various forms of government among nations that have been significant in U.S. history (e.g., absolute monarchy in England or France, Germany under Hitler, the Soviet Union under Stalin) (C-1A-H2)

9. Analyze or assess issues related to the distribution of powers at the federal level (e.g., tensions among the three branches of government, roles and responsibilities of the three branches) (C-1A-H3)

46. Assess the extent to which a given U.S. foreign policy position has helped or hindered the United States' relations with the rest of the world (C-1C-H2)

http://www.doe.state.la.us/lde/uploads/3949.pdf

Do we even act as if we expect students to think?

?????????

Learning and Innovation Skills

are being recognized as the skills that separate students who are prepared for increasingly complex life and work environments in the 21st century, and those who are not.

http://www.21stcenturyskills.org/route21/

The four missing Cs…

Creativity

Critical thinking

Communication

Collaboration

A focus on creativity, critical thinking, communication and collaboration is essential to prepare students for the future.

http://www.21stcenturyskills.org/route21/

Critical Thinking and Problem Solving

- Exercising sound reasoning in understanding
- Making complex choices and decisions
- Understanding the interconnections among systems
- Identifying and asking significant questions that clarify various points of view and lead to better solutions
- Framing, analyzing and synthesizing information in order to solve problems and answer questions

http://www.21stcenturyskills.org/route21/

Do we know higher order thinking when we see it.

In 16 observations of 30 minutes duration in an elementary school, only four of sixteen teachers involved students in tasks or interactions that required higher-order thinking. . .and doing so was a school-wide goal.
(Armstrong, Nov. 2009)

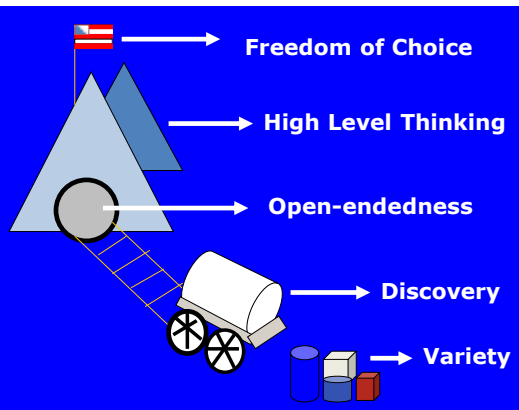
In a recent interview of six high school students …

Students express that they don't feel motivated to do anything but pass the test because the classroom has become impersonal and dull.

"Fun" is being taken out of the classroom due to the focus on covering all the material for the test.

Students enjoy elective courses more because they can be creative and have "hands on" experiences.

"The tests are a hassle, but they are *not* too challenging, so that is o.k."



How can we motivate students by consistently infusing thinking, problem-solving, and creativity into instruction?

Environment Changes the Brain

Enriched environments
- increased cell weight
- increased branching of dendrites
- more synapses

Impoverished environments
- decrease in cell weight,
- possible loss of cells,
- diminished synapses

"Neurons that fire together, wire together."
Pat Wolfe via Bob Sylwester

LTP Long Term Potentiation— the process of connections in the brain becoming more permanent (learning.)

The more permanent the connection, the greater the mylineation.

The second time a synapse fires, it takes less neurotransmitter (and so on…)

Our brains mylinate from back to front and inside to outside (according to how we survive.)

Experience sculpts the brain.

- Between the second month in utero and the age of two, each neuron in the cortex forms an average of 1.8 synapses per second.
- Which synapses remain, and which are pruned, depends on whether or not they carry any traffic. If not used, then like bus routes that attract no customers, they go out of business.

BDNF—Brain-Derived Neurotrophic Factor

While neurotransmitters carry out signaling, neurotrophins such as BDNF build and maintain cell circuitry—the infrastructure itself.

BDNF enhances growth of dendritic branches— in turn solidifying connections of more synapses.

THERE'S MORE

BDNF improves the function of neurons, encourages growth, and strengthens and protects them against the natural process of cell death.

BDNF is an essential link between thought, emotions, and movement—particularly seeming to be important for long-term memories. Ratey, 2008

Exercise improves learning on Three levels:

- Optimizing your mind-set to improve alertness, attention, and motivation
- Preparing and encouraging nerve cells to bind to one another, which is the cellular basis for logging in new information
- Spurring the development of new neurons from stem cells in the hippocampus. Ratey, 2008

Attention

Learning

Boosting Recall

The very last part of the brain to be pruned …is the prefrontal cortex, home of the so-called executive functions —*planning, setting priorities, organizing thoughts, suppressing impulses, weighing the consequences of one's actions.*

Discover Magazine
May 2004

A demonstration of mental processes in the brain…

Specific "tasks" activate the brain in different ways.

Procedural Memory

Declarative (Semantic) Memory

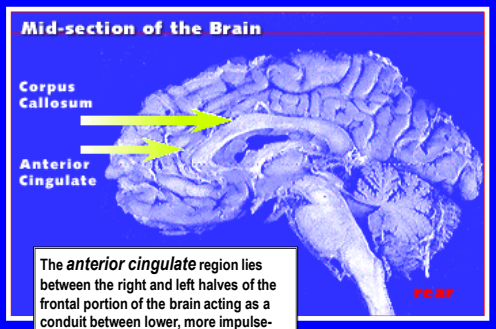
Stroop Effect

Red blue green yellow orange

Is there a shift in the brain when students are asked to think?

Stroop Effect

Moving from automatic responses to "reasoned" responses.



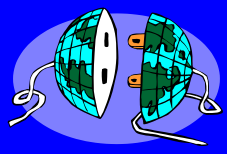
The *anterior cingulate* region lies between the right and left halves of the frontal portion of the brain acting as a conduit between lower, more impulse-driven brain regions and higher, more rationally-driven behaviors.

Source: NOVA, PBS, 2000

APK

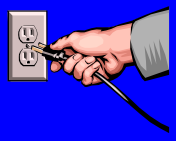
The importance of connecting new content to prior knowledge cannot be over-emphasized!!!!!

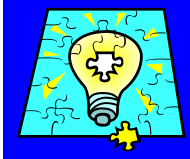
Meaning (connections)



No connections….no Meaning

The brain is continuously trying to make sense out of the world, attempting to determine what is meaningful in what it experiences.





Every encounter with something new requires the brain to fit the new information into an existing memory category, or network of neurons.

If it can't, the information will have no meaning.

Effective instruction requires teachers to…

- **Find the experiences students have had and hook new learning to them or…**
- **Create the experiences with students**

Novelty

Story-telling

(Our brains remember stories before lists!)

- Metaphor
- Embed stories into content– personal and unusual

Use of props

- Hats, bobbing headbands

Presenting content with a "new twist"

- Divergent questions

Cognitive Dissonance

Debate

Simulations

Devil's Advocate

MATH: If this is the answer...what is the problem?

The answer is:	The problem could be:
7	3 +4 42/6 (3 x 9)-20
2 ½	5/6 + 1 2/3 7 ¼ -4 ¾
$a = \frac{b}{5}$	**a = (3b-2b) 5 ? Or ?**

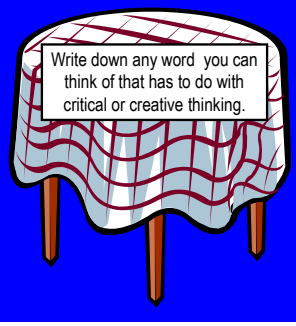
Establish a culture of inquiry!

Building Thinkers...

Building Thinkers Survey

ARE SUCCESSFUL TEST-TAKERS SUCCESSFUL THINKERS?

Roundtable



Write down any word you can think of that has to do with critical or creative thinking.

Divergent Questioning Strategies

- *Fluency*
- Flexibility
- Originality
- **Elaboration**

Sample Questions with **Technology** in Mind

Fluency: the ability to generate many ideas *(Think of all possible technology tools or devices that are used at home or school).*

Flexibility: the ability to generate many different ideas *(What multiple uses of existing technologies are or could be developed?)*

Originality: the ability to generate unique ideas. *(What new or novel technologies might potentially be developed over the next fifty years?)*

Elaboration: the ability to generate many details. *(Select one of the prospective technologies and provide additional details about its possible function and form.)*

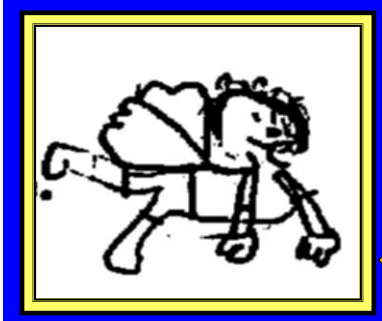
Use of Metaphor

Only the human brain can think metaphorically and see relationships that computers could never detect.

"Everything you create is a representation of something else; in this sense, everything you create is enriched by metaphor." Twyla Tharp

A Whole New Mind by Dan Pink, p. 139

Back to Building Thinkers.



What do you think this is?

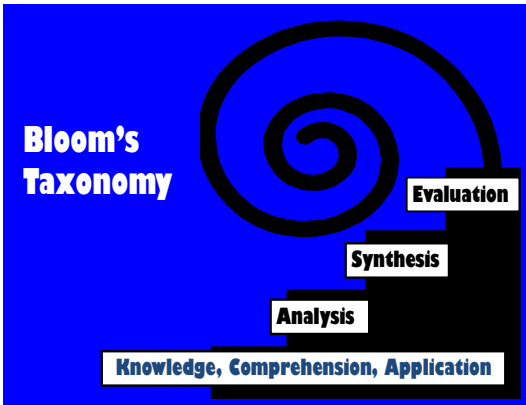
Do Better Questions Produce Better Minds?

"The better the quality of the questions asked, the more the brain is challenged to think." (Berliner)

"Learner performance scores improved when the questions asked of learners improved in depth." (Redfield)

Sarah Armstrong, Ed.D.

Bloom's Taxonomy



Bloom's Taxonomy

Knowledge	***"I know."*** list; recite; tell; name; tell; label; record; copy; report; memorize; define
Comprehension	***"I understand."*** describe; translate; summarize; infer; interpret; locate; identify; recognize; review; describe; restate; explain; report
Application	***"I can use it."*** do; use; act out; dramatize; personalize; solve; apply; illustrate; translate; interview; schedule; practice; operate
Analysis	***"I can break down information."*** analyze; dissect; compare; contrast; diagram; categorize; differentiate; criticize; debate; inventory; solve; experiment
Synthesis	***"I can create."*** create; design; invent; compose; hypothesize; elaborate; plan; organize; formulate; propose; prepare; predict
Evaluation	***"I can make judgments based on information given."*** evaluate; choose; select; criticize; value; appraise; estimate; predict

Bloom's Revised Taxonomy

Creating—*generating new ideas, products, or ways of viewing things;* designing, constructing, planning, producing, inventing

Evaluating—*justifying a decision or course of action;* checking, hypothesizing, critiquing, judging, experimenting

Analyzing—*breaking information into parts to explore understanding and relationships;* finding comparing, organizing, deconstructing, interrogating

Applying—*using information in another familiar situation;* implementing, carrying out, using, executing

Understanding—*explaining ideas or concepts;* interpreting, summarizing, paraphrasing, classifying, explaining

Remembering—*recalling information;* recognizing, listing, describing, retrieving, naming, finding

Web source for New Bloom

http:/www.kurwongbss.qld.edu.au/

Synthesis and Summarizing

"Somebody Wanted But So"

Somebody (Character)	wanted (Key Problem)	but (Conflict)	so (Outcome)

Example: Charlotte wanted to do something to save Wilbur's life but she didn't know what she could do, so she tried spinning words into her spider webs to make people believe he was a very special pig.

Example: Lewis and Clark wanted to discover a navigable water route from the Mississippi to the Pacific Ocean but were unsuccessful; so they traveled by foot and boat to the Pacific and a year later returned home with maps and scientific journals of their trip.

In what ways is this picture like…

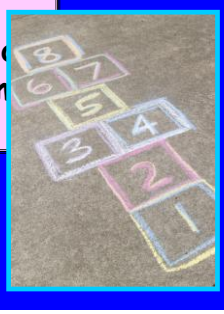
- Keeping up with homework.
- Global warming
- The South (or North) in the Civil War
- The three branches of government
- Dimmesdale or Prynne in *The Scarlet Letter*.

Attribute Association

- List 10 attributes of an item, concept, artifact, etc.
- Write in order for the class to see or ask students to write them down in order from 1-10.
- Have sets of cards numbered 1-10. You will need one set per pair. (You can also use decks of cards pulling out ace to 10).
- Have each student select one card randomly. They are to look at the words that correspond with their numbers and come up with commonalities between the two words.
- Have them put those cards aside and pull two more out. Do this several times.
- Note: You may use fewer attributes, but will need to adjust the number of cards.

List words that might be used in a story about the Gulf Oil Spill.
List words or phrases that describe life in a middle school.
List terms or words that relate to plate tectonics.
List words that relate to Europe in World War II

Pick three numbers between 1 and 10 and write them down so that no else can see them



Glossary:

1. **arable**: *refers to land that is able to be farmed.*
2. **emigrate**: *to leave one's country to live in another country.*
3. **asylum**: *a refuge or safe haven.*
4. **illiterate**: *unable to read.*
5. **malnourished**: *receiving less than the minimum amount of food.*
6. **longevity**: *endurance and long life.*
7. **megacities**: *cities with populations of ten million or more.*
8. **migrate**: *to move from one place to another.*
9. **persecution**: *causing people to suffer because of their beliefs or origin.*
10. **status**: *position or rank in relation to others.*

Divergent Questioning Model

Quantity Model

Pattern: How many ways . . . . .?
List the reasons for. . . .
List all of the . . . . .

Viewpoint Model

Pattern: How would this look if you were a. . .? *or the main character was a* . . . .?
You are a _____. What would happen if . . . .?
What would *(character, historical figure, etc.)* do if. . .?

Involvement Model

Pattern: How would it feel if *it were human and could feel*?
How would you feel if you were _____?
You are a _____. What does _____ look like from your point of view?

Forced Association Model

Pattern: How is _____ like a _____?
How can you get ideas from _____ to help you work on _____?
How can thinking about _____ help us solve this problem?

Reorganization Model

Pattern: What would happen if . . . . .?
Suppose _____occurred? What would be the consequences?
What would *{something}* be like if . . .?

Forced Association Model

Pattern: How is _____ like a _____?
How can you get ideas from _____ to help you work on _____?
How can thinking about _____ help us solve this problem?

Examples:
How is a thermometer like a calendar? *(Math)*
How is a lunch tray like a map? *(Social Studies)*
How is Martin Luther King, Jr. like an automobile? (History)
How is the Age of Enlightenment like an interstate highway?
How is Huck Finn like tractor? *(English)*
How is a cell like a refrigerator? *(Biology)*
How is writing a research paper like planting a garden? *(English)*

I, too, sing America
I am the darker brother.
They send me to eat in the kitchen
When company comes,
But I laugh,
And eat well,
And grow strong.

Tomorrow,
I'll be at the table
When company comes.
Nobody'll dare say to me
"Eat in the kitchen,"
Then.
Besides
They'll see how beautiful I am
And be ashamed—
I,too, am America.

Langston Hughes

Quantity: List the kinds of discrimination faced by African Americans in the 1930's.

Viewpoint: You are the kitchen "table." Describe the conversations you hear?

Forced Association: How is *not* "eating with company" like being second string on a sports team?

Reorganization: How would the poem be different if the author didn't believe in "tomorrow?"

The brain has an immediate response to symbols, icons and strong, simple images.

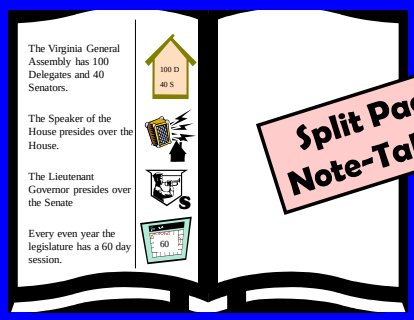
Ninety percent of the brain's sensory input is from visual sources.

Eric Jensen

Nonlinguistic representations

Marzano, Pickering, Pollack

"Our brains remember pictures before we remember words."



Summarize text (or content) using only non-linguistic representations (pictures, images or icons.)

Ocean Fish Populations Plummet

There aren't many fish in the sea. Last May biologists at Dalhousie University in Halifax, Nova Scotia, reported that global stocks of large predatory fish have declined by 90 percent since industrial fishing began in the mid-1950's. Not surprisingly, some of the greatest losses have come from species people eat: swordfish, tuna, cod and shark. Among the sources Dalhousie biologists Ransom Myers and Boris Worm looked at were the records of Japanese boats that use fishing lines up to 60 miles long, with 2,000 or more baited hooks, to catch anything that will bite. In a matter of 15 years, catches per hundred hooks dropped from around 10 to one. The boats were catching fish faster than the fish could reproduce.

A good deal of industrial fishing occurs in international waters, where fleets compete with little oversight or regulation. Commercial fishers have long resisted quotas and moratoriums that would allow fish populations to rebound, and governments have not done much about it. One large study of America's ocean waters, published in May by the Pew Oceans Commission, noted that U.S. policies have for decades focused on developing ocean resources rather than emphasizing conservation.

Are tuna, swordfish, and shark headed for extinction as a result? "Mostly not," Myers says, "Though I view the shark declines as very serious." Sharks are slow to reproduce, so they may disappear in areas such as the North Atlantic. In some cases, when over-fishing has been slowed or stopped, species such as striped bass have rebounded. But no one really knows what happens when the top predators disappear from a large ecosystem—or what other fish are lost along the way.

–Michael W. Robbins
Discover Magazine, January 2004

Plus/Minus Issue Organizer

Problem or Key Issue

Excessive fishing of our oceans may irreversibly deplete the marine eco-system.

+	–
◦Oceans are considered open domain when it comes to harvesting fish. ◦Fishing provides a livelihood for many people ◦The demand for fish is at the highest level ever.	◦The large fish (predators) will become sparse allowing other species to flourish. ◦Fish may become extinct. ◦Over fishing results in smaller, weaker fish.

Summary or Concluding Statement

It is essential that a compromise be reached between environmentalists and the fishing industry before it is too late.

In Closing…

Reader's Theater

"We know how to develop a literacy of thoughtfulness. There are no secrets here. If you want young people to think, you ask them hard questions and let them wrestle with the answers. If you want them to analyze something or interpret it or evaluate it, you ask them to do so and show them how to do it with increasing skill. If you want them to know how to approach interesting or difficult problems, you give them interesting or difficult problems and help them develop a conscious repertoire of problem-solving strategies. If you want them to think the way scientist or historians or mathematicians do, you show them how scientists and historians and mathematicians think, and you provide opportunities for them to practice and compare those ways of thinking."

Rexford G. Brown, Schools of Thought, p. 232

Promote Higher Order Thinking …

Be intentional about applying insights about the brain and learning into daily instruction.

- Lecture less and plan opportunities for students to engage.
- Make content relevant to students' daily lives.
- Design questions and tasks that make students think creatively and critically.

Make students do the work of thinking!!